

# Leno Weaving and Design

By W. E. SHINN and A. E. McKENNA, CLEMSON COLLEGE, S. C.

The class of fabrics commonly referred to as lenos includes a wide variety of materials, all of which are similar in structure in that certain warp threads or groups of threads are caused to cross one another in intersecting with the filling threads. This crossing of the warp threads gives the fabric a very firm structure, and a fabric woven on the leno principle is considerably stronger than other fabrics containing a similar number of ends and picks per inch of the same yarns.

The shedding means for leno weaving is necessarily different from that employed for straight weaving. In addition to the regular harnesses and heddle eyes, a special shedding device known as a doup is usually required. The doup formerly consisted of a loop formed

present time the majority of leno fabrics are being woven on steel doups.

Fig. 1 illustrates an assembly of a mechanism for cross-weaving made entirely of steel wire. The units consist of a doup needle (a) which is a thin fork-shaped element with an eye at (b) through which the thread (c) is drawn. The doup needle is supported by two standard heddles (d) and (e), either of which is capable of lifting the doup needle and bringing the thread (c) to the top of the shed. A second thread (f) is drawn between the standards directly over the doup thread and is shifted either to the right or left of the doup thread (c), according to whether standard number 1 or number 2 is raised.

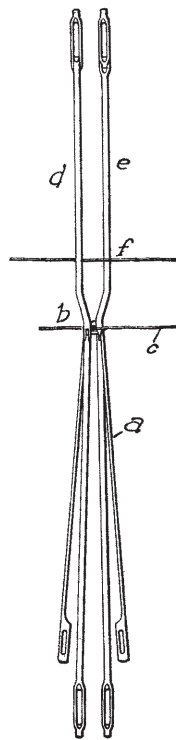


Figure 1  
Steel Doup Mounted on Standard Heddles.

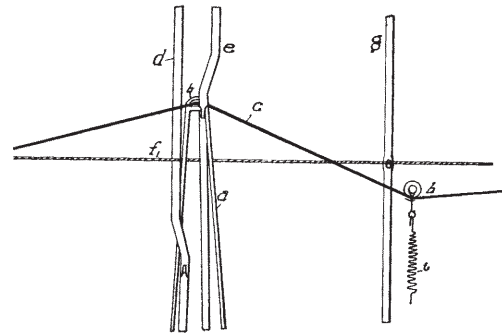


Figure 2a  
Open Shed; Second Standard Raised.

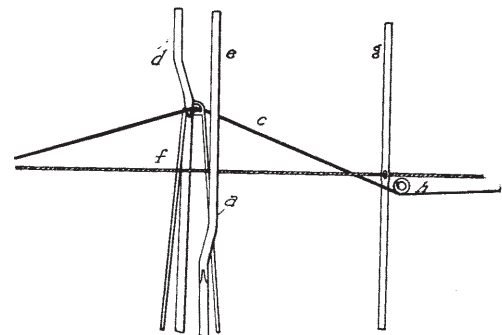


Figure 2b  
Cross Shed; First Standard Raised.

from twine of worsted or ramie fiber. The severe strain to which the doups were subjected caused them to wear rapidly, so that at the

Figs. 2A, 2B and 2C show the three possible means of shedding with a plain steel doup. Fig. 2A is the open shed. The second

standard (e) is up and the doup thread (c) is lifted to the right of the ground thread (f).

The draft illustrated is for weaving plain marquisette in which one end crosses a second end on alternate picks. The doup thread (c), in addition to passing through the doup needle, is passed under an ease bar (h) which is under the control of springs (i). This takes the place of the regular positive slackener or easer sometimes used in weaving marquisette. Fig. 2B illustrates the cross pick. The front standard (d) is lifted to carry the doup needle (a) and the doup thread to the left of the ground thread (f).

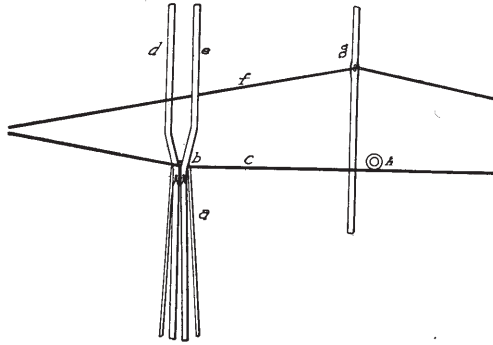


Figure 2c  
Open Shed; Ground End Raised.

The roll (h), in addition to serving the purpose of easing the doup thread, relieves the ground thread of considerable strain by preventing the crossing thread from lifting it from below. It also enables a much clearer bottom shed to be formed on the crossed pick. Fig. 2C shows the third possible shed with the steel doup. Both the standards are down, thus causing the crossing ends to form the bottom shed while the ground ends (f) form the top shed. This shed alternating with the first shed will produce a plain weave. It is thus possible to have plain weave in combination with leno and produce a pattern on leno ground.

Fig. 3 is a partial view of a loom equipped to weave plain marquisette. The doup needle is shown mounted on a pair of standard harness and is pulled downward by two steel ribs (p) which are weighted by a spring (q) through the yoke (j). The ground harness (r) is brought to the center of the shed on

each pick to facilitate the crossing of the doup thread by means of a jumper motion which operates from the crank shaft through arm (o), rod (n), levers (m) and (l) and the strap (k).

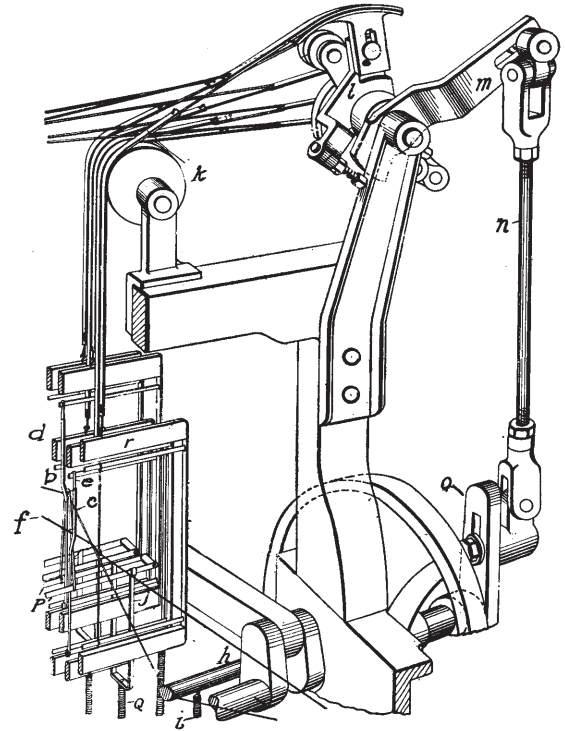


Figure 3  
Diagram of Leno Attachment for Weaving Marquisette.

### Avoid Crowding Fine Constructions

The equipment shown in Fig. 3 may be applied to an ordinary automatic loom for weaving plain marquisette or stripe patterns for curtains, etc. The ease bar (h) takes the place of the positively operated slackener used on dobbies and permits the use of drop wires on both the ground and doup ends, as there is always sufficient tension on the warp ends to prevent the drop wires from dropping. In the case of very fine constructions it is necessary to use two sets of doups to prevent crowding. The assembly in Fig. 3 shows a second set of doups in place. In weaving marquisette it is advisable to use two sets of doups when the ends per inch exceeds twenty-four.

Care should be taken in setting the harness so that a uniform top shed is formed. In

case two sets of doups are used they should both give the threads the same effective lift. Failure to do this may cause reed markings or lack of uniformity in the leno. The jumper harness is so timed that it reaches the bottom of the shed when the crank is on top center. This causes the shed to be open when the shuttle enters.

### Limitations of the Plain Doup

The steel doup is well adapted to dobby work and is used in producing patterns similar to those formerly made with cord doups. The plain doup, however, is limited in that it is rigid and can not be used in the production of fancy patterns on a single set of doups, as is possible with cord doups. Every doup end must be lifted on the open pick where a single set of doups is used, and an extra set of doups is required for every change in the pattern.



Figure 4  
Diagram of Slotted Type Heddle.  
(Courtesy H. E. Littlejohn.)

### The Slotted Steel Doup

The limitation of the plain steel doup was overcome by the invention of the slotted doup.

Fig. 4 is an assembly of the slotted or super doup with the two standard heddles. Its operation is similar in principle to that of the plain doup. The only difference is that one leg of the doup is slotted and thus permits the doup end to be either up or down on the open pick. It is therefore possible to weave leno and the plain weave in combination on a single set of doups.

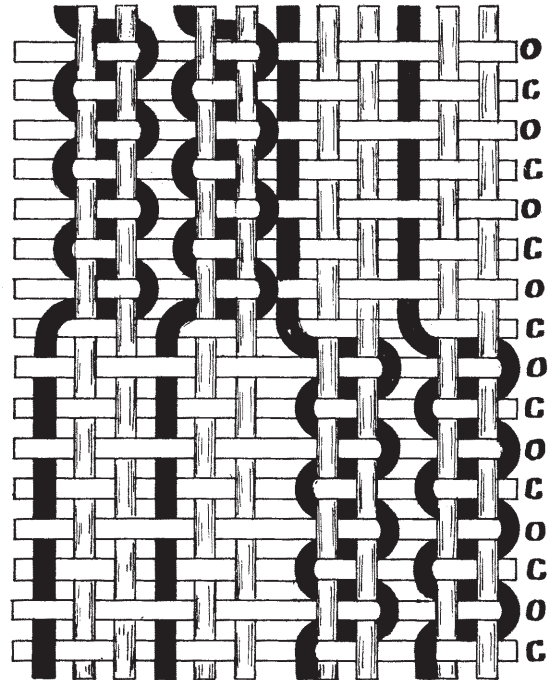


Figure 5a  
Diagram of Figured Lenno Weave.

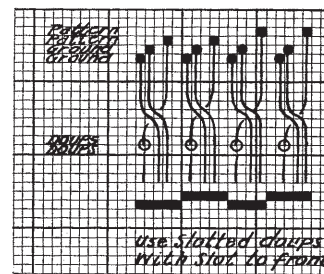


Figure 5b  
Drawing-In Draft for Figured Three-End Lenno.

Fig. 5B shows a drawing-in draft for a figured three-end leno in which the ground ends are to work plain, while the two pattern harnesses are to form a design by alternately weaving leno and plain, remaining at the bot-

tom of the shed on the open pick. Note that the doups are arranged with the slot to the front so that it will be open when the second standard is raised.

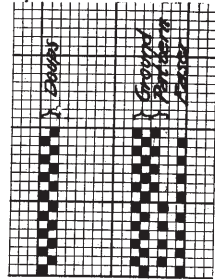


Figure 5c  
Chain Plan.

Fig. 5C is the chain plan while Fig. 5A illustrates the manner in which the threads will be interlaced. The possibilities of the slotted doup will be more fully explained under the general heading of fabrics woven on slotted steel doups.

#### Fabrics Woven on Plain Steel Doups

*Marquisette.* Marquisette is the trade name for a lightly constructed fabric interlaced by a method known as plain leno. This fabric is used to such a large extent that no sample exactly corresponding to it will be shown in

marquisette and the stripe pattern would be exactly alike.

Only one beam is necessary for weaving these fabrics and the warp is usually drawn in right-hand doups, which means that the doup ends are drawn through the eye of the doup to the right of the ground end. The reason for using this method is that the general custom of drawing-in warps is from the right-hand side to the left-hand side, and it is easier to draw the doup end in bottom doups through the eye of the doup first and then draw the ground end through the legs of the doup above the doup end. The selvage ends must be placed on a separate beam, or on spools, to allow for the difference in the take-up. These border ends are usually drawn through separate harnesses located between the doup sets and the ground harness. However, on this type of cloth the selvage may be and frequently is woven on the front set of doup harnesses, by placing regular heddles on the doup standards which operate in plain weave order.

*Warp Stripe Effects.* Fig. 6A illustrates the manner in which warp stripe effects may be obtained for curtain goods by varying the construction in sections across the width of the fabric. This line pattern was accom-

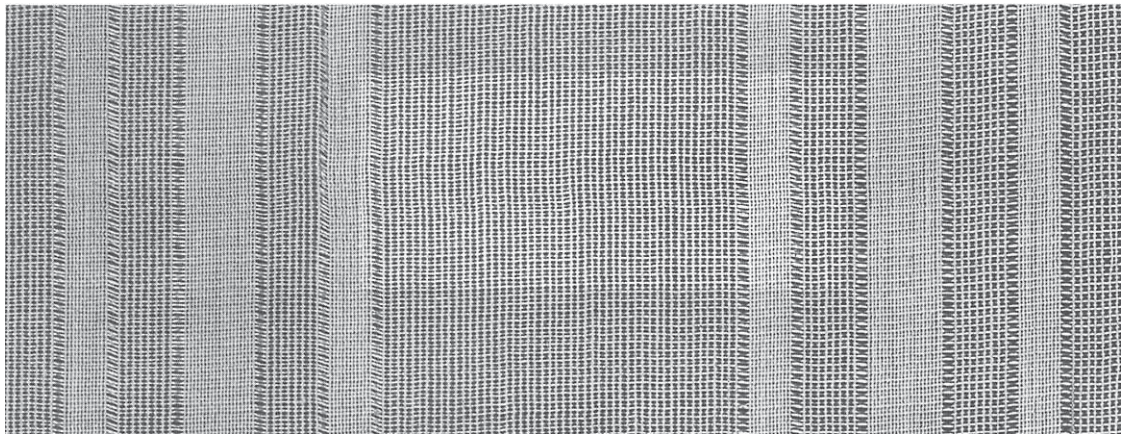


Figure 6a. Striped Leno Fabric.

this article. However, Fig. 6A was woven in a similar way with the exception that dents were skipped in the reed to obtain a stripe effect. The drawing-in and chain drafts for

plished, as shown at the drawing-in draft, Fig. 6B, by skipping dents in the reed. Alternate dents were skipped in the ground spaces. Every dent was used in the stripes, and three

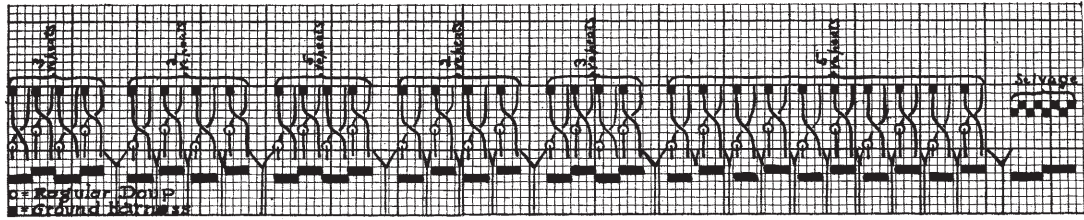


Figure 6b. Drawing-In Draft for Cloth at Figure 6a.

dents are skipped where the two portions come together. The chain draft is shown in Fig 6C.

*Cross Border Effects.* Patterns may be obtained on plain type steel doups by forming plain weave where filling stripes are desired. Fig. 7A illustrates a fabric of this type. Plain

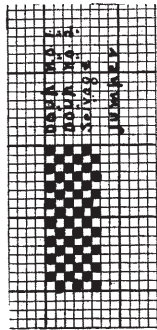


Figure 6c. Chain Draft.

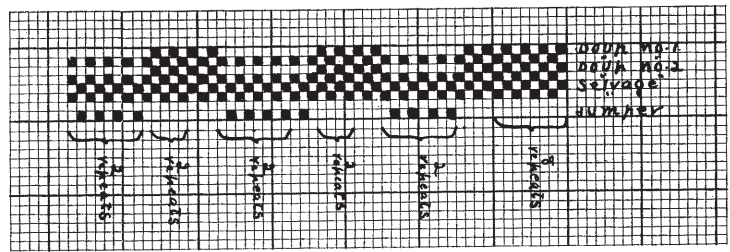


Figure 7b. Chain Draft for Cloth at Figure 7a.

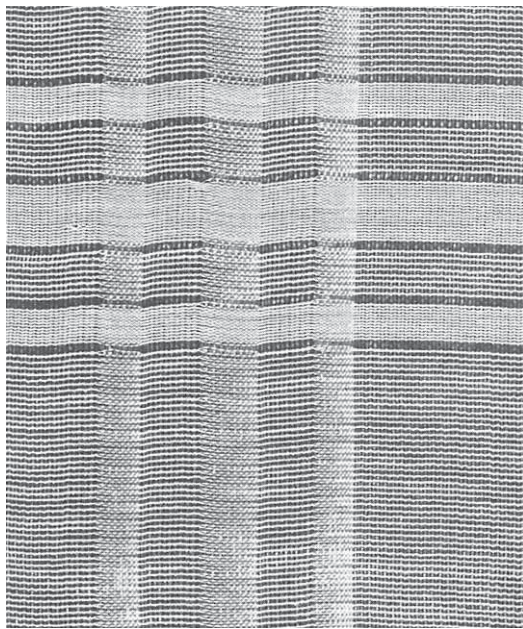


Figure 7a. Checked Leno Fabric.

In weaving this fabric, the slackening operation was performed by an ease bar located just to the rear of the ground harness; the doup end being drawn below this bar.

weave is formed by raising the ground harness to the top of the shed and lowering all doup standards on every alternate pick. On the other picks, the ground harness remains down and the second standard is raised to bring the

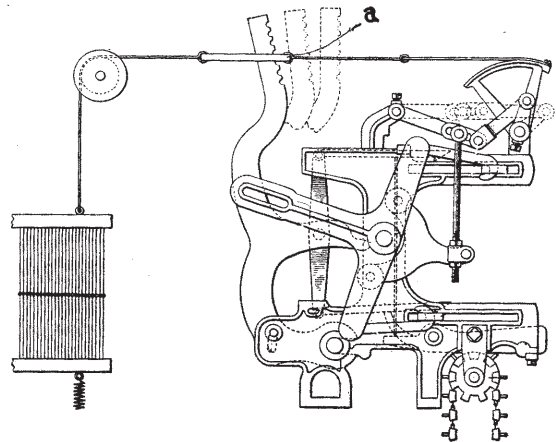


Figure 8. Dobby Head with Jumper Attachment.

doup end up on the same side of the ground end as that in which it was drawn. The ground harness, which is connected to the jumper motion, is raised to the top of the

shed by a segment or link which is passed around a dobby lever and serves as a connection between the harness and the jumper motion. Ordinarily when leno is being formed, the link (a, Fig. 8) moves with the jumper motion about the harness lever, but when plain weave is formed the dobby lever is raised and, consequently, the ground harness by means of the link.

The heavier filling stripe in this sample, due to the heavy beat-up, was woven without the use of check pegs. On some constructions of filling bordered gauze, check pegs may be necessary in order to obtain the desired effect. The drawing-in draft for this fabric is the same as that used for Fig. 6A. The chain draft is shown in Fig. 7B.

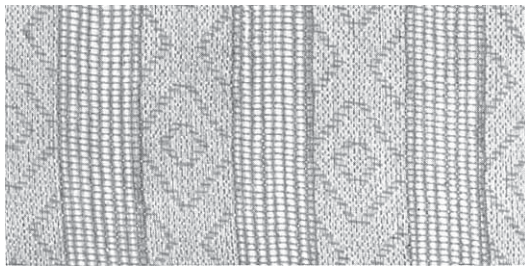


Figure 9a.  
Fabric with Leno and Diamond Weave Combination

Fig. 9A illustrates a curtain fabric composed of a stripe arrangement of leno and figured rib weaves. A number 30 reed was used and every alternate dent skipped on the leno stripe.

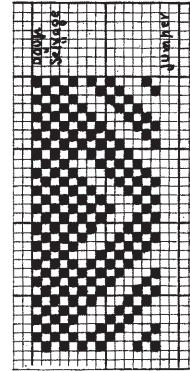


Figure 9c  
Chain Draft.

In addition to separate selvage spools, two beams were used for the body warp; the bottom beam containing 30's single yarn for the rib stripe and the top beam containing 40's single yarn for the leno stripe. Figs. 9B and 9C show the corresponding drawing-in and chain drafts for this pattern. In closely constructed leno fabrics it is advisable to use a two-ply yarn, because its use results in less

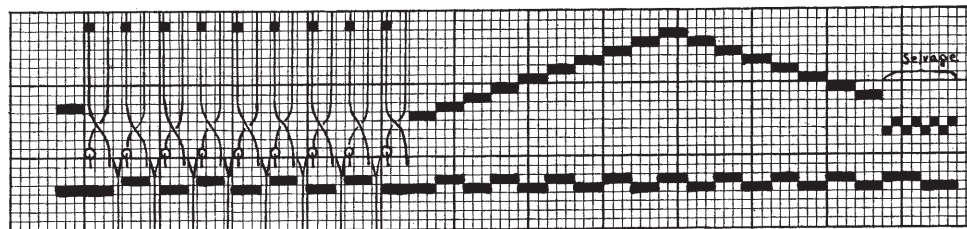


Figure 9b. Drawing-In Draft.

*Combination Effects.* Patterns of combined leno and other weaves form interesting designs for dress, shirting and curtain goods.

thread breakage and consequently fewer imperfections and a greater production.

(To be continued)